

claims

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1. Method for cutting a workpiece by using a laser beam and an assist gas, in which at least one optical means is used to focus the laser beam at several focal points, separate from one another, and in which, as assist gas for the said laser beam, a gas mixture containing hydrogen and at least one inert gas is used.
2. Method according to Claim 1, characterized in that the optical means is transparent or reflecting and is chosen from lenses, mirrors and combinations thereof, preferably a bifocal lens.
3. Method according to either of Claims 1 and 2, characterized in that the workpiece to be cut is made of stainless steel, coated steel, aluminium or aluminium alloy, non-alloy steel or alloy steel.
4. Method according to one of Claims 1 to 3, characterized in that the inert gas is chosen from nitrogen, argon, helium and mixtures thereof, preferably the inert gas being chosen from nitrogen, argon and mixtures thereof.
5. Method according to one of Claims 1 to 4, characterized in that the assist gas contains from 150 ppm by volume to 40% by volume of hydrogen, preferably from 0.5% by volume to 30% by volume of hydrogen, the balance being the inert gas.
6. Method according to one of Claims 1 to 5, characterized in that the assist gas consists of 5% by volume to 30% by volume of hydrogen, the balance being nitrogen.
7. Method according to one of Claims 1 to 6,

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in that the thickness of the cut is between 0.2 mm and 0.3 mm and 16 mm.

According to one of Claims 1 to 10, in that the cutting speed is between 20 m/min and 200 m/min.

According to one of Claims 1 to 10, in that the optical system is arranged to obtain at least one focus of the laser beam near the upper surface of the workpiece to be cut, preferably so as to focus the laser beam on the upper surface, or in that the workpiece to be cut is arranged in a region of the workpiece near the upper surface, and at least one focus of the laser beam is positioned near the lower surface of the workpiece to be cut and in the region of the workpiece outside the latter.

According to one of Claims 1 to 10, in that the assist gas flow rate can be adjusted according to the material of the workpiece to be cut.

A cutting apparatus for implementing one of Claims 1 to 10, comprising:

- one laser generator for producing a laser beam;
- one cutting nozzle with an inlet and at least one outlet;
- one transparent or reflecting optical system of the multifocus type for directing the laser beam at several focal points on the workpiece;
- one source of assist gas;
- and at least one inert gas source for feeding the cutting nozzle.

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- 5 8. Method according to one of Claims 1 to 7,
characterized in that the cutting speed is between
0.5 m/min and 20 m/min
- 10 9. Method according to one of Claims 1 to 8,
characterized in that the optical means is
arranged so as to obtain at least one first focal
point positioned near the upper surface of the
workpiece to be cut, preferably so as to coincide
with the said upper surface, or in the thickness
of the workpiece to be cut in a region close to
the said upper surface, and at least one second
focal point positioned near the lower surface of
the workpiece to be cut and in the thickness of
the latter, or outside the latter.
- 20 10. Method according to one of Claims 1 to 9,
characterized in that the assist gas contains
hydrogen in an amount adjusted according to the
thickness and/or the constituent material of the
workpiece to be cut.
- 25 11. Laser beam cutting apparatus for implementing a
method according to one of Claims 1 to 10, comprising:
- 30 - at least one laser generator for generating at
least one laser beam;
- at least one cutting nozzle with at least one
laser beam inlet and at least one laser beam
outlet;
- 35 - at least one transparent or reflecting optical
means of the multifocus type for focusing the
said laser beam at several focal points; and
- at least one source of assist gas containing
hydrogen and at least one inert gas for the
said laser beam and for feeding the said nozzle

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with the said assist gas

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12. Laser beam cutting apparatus for implementing a method according to one of Claims 1 to 10, comprising :

- at least one laser generator for generating at least one laser beam;
- at least one cutting nozzle with at least one laser beam inlet and at least one laser beam outlet;
- at least one transparent or reflecting optical means of the multifocus type for focusing the said laser beam at several focal points;
- at least a first source of gas containing at least hydrogen;
- at least a second source of gas containing at least one inert gas; and
- gas mixing means for mixing the gas coming from the first gas source with gas coming from the second gas source so as to obtain an assist gas for the said laser beam containing hydrogen and at least one inert gas, the said assist gas feeding the said nozzle.

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